DEHYDRATION IN THE LOWER ANTARCTIC STRATOSPHERE IN LATE WINTER AND SPRING

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The history of minimum temperatures at 50 and 70 mb is examined from NMC, UK Met O and ECMWF analyses. MSU channel 24 data are similarly inspected. South Pole sonde data are used to calculate saturation humidity mixing ratio as a function of altitude and time throughout 1987. Saturation with respect to ice could be maintained for water mixing ratios of 3.5 ppmv for a period of about 80 days from mid-June to mid-September. Dehydration to mixing ratios of 1 ppmv or less was possible sporadically.

Data from the ER-2 flights between 53°S and 72°S are used in conjunction with particle size measurements and air parcel trajectories to demonstrate the dehydration occurring over Antarctica. Water mixing ratios at the latitude of Punta Arenas (53°S), in conjunction with tracer measurements and trajectory analysis, show that at potential temperatures from about 325 to 400K, the dryness (< 3ppmv) had its origin over Antarctica rather than in the tropics.

Water mixing ratios within the Antarctic vortex varied from 1.5 to 3.8 ppmv, with a strong isentropic gradient being evident in the region of high potential vorticity gradients.